



Canadian

QUESTIONS AND ANSWERS

TRICKS AND TOPICS

This issue presents in expanded form two of the popular Ham News' departments, "Tricks and Topics" and "Questions and Answers." All the entries are from our north-of-the-border friends, the VE's. Judging from these entries, amateur problems in Canada are not one bit different from amateur problems in the U.S.A.

—Lighthouse Larry



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MAXIMUM RATINGS AND TYPICAL OPERATION

D. R. Hansen, VE3ACX

Ottawa, Ontario

Question: How are the Maximum Ratings that are generally included in transmitting tube data arrived at? Is it ever permissible to exceed these ratings and, if so, in what type of service and with what probable result as regards tube life?—VE3ACX

Answer: The data sheet of almost any transmitting tube contains information of two types. One set of information is the Maximum Ratings referred to in the question, and the other set of information is called Typical Operating Conditions. The Maximum Ratings are intended to be just what the name implies, that is, ratings that should not be exceeded. Typical Operating Conditions are examples of various voltages and currents that are likely to occur when the tube is operated as specified. Let us discuss both types of information.

Maximum Ratings are placed on plate voltage, screen voltage, and grid voltage. These voltage ratings are those which the tube manufacturer knows it is safe to use, from the standpoint of the physical and mechanical properties of the tube. For example, if the rated maximum plate voltage is stated as 3000 volts, then the tube in question may be operated safely at this voltage. If a higher voltage were to be used, a voltage fault of some sort might occur, such as excessive leakage across an insulator, or perhaps even an arc between electrodes.

The same sort of reasoning applies to screen voltage and grid voltage. Of course, some safety factor is included in these ratings, but this safety factor is one which has been computed for the particular tube type in general. If you were to exceed some maximum voltage rating, it might just be that you would do it on a tube that was very close to the limit on internal spacing, and a voltage failure would occur.

Maximum Ratings are also placed on the various currents, such as plate current, screen-grid current and grid current. The tube manufacturer does his design work in terms of peak currents, and these allowable peak currents depend upon the amount of emission available from the filament. Knowing the available emission, the manufacturer computes the peak currents allowable, and then transfers these peak current figures into d-c current values which are then used as Maximum Ratings. This philosophy holds for plate and screen-grid currents, but the maximum allowable control-grid current is figured on a different basis.

The control grid is a relatively fragile element. It is capable of dissipating only so much energy before it melts or deforms. Therefore the Maximum Rating for control-grid current is set at a figure which will not permit the grid to overheat.

In exactly the same fashion, the Maximum Allowable Plate Dissipation is a figure which the plate or anode of the tube can dissipate safely without overheating.

Maximum Allowable Input is a rating based upon operation of the tube at the maximum expected efficiency. That is, if the maximum efficiency possible is known to be seventy-five percent, and the maximum allowable plate dissipation is 250 watts, then the maximum allowable input would be one kilowatt.

Another rating frequently given is the maximum frequency at which it is permissible to use the other Maximum Ratings. This rating is brought about because as tubes are operated at higher and higher frequencies, they reach a point where the efficiency begins to fall off rapidly. At this frequency it is necessary to derate all Maximum Ratings, else the various elements will overheat due to the lower efficiency.

From the above discussion it is obvious that Maximum Ratings cannot be used together. That is, if the maximum voltage is 3000, and the maximum plate current is given as 300, it would not be possible to run the tube at 3000 volts with a plate current of 300 mls, because by so doing you would be exceeding either the plate dissipation or the maximum allowable input.

To save the user of the tube from the bother of computing a set of operating conditions that are safe, the tube manufacturer has done this for a number of different voltages, and these are called Typical Operating Conditions. Let us examine a set of these for the GL-810.

For a d-c plate voltage of 2000 volts and a d-c grid voltage of minus 160, the peak r-f grid voltage should be approximately 330 volts. Under these conditions the d-c plate current should be adjusted to 250 mls. The typical grid current is listed as 40 mls, and the power output is shown to be 375 watts.

These are the conditions that you would find if your transmitter used a GL-810 that was exactly an average tube in all respects. However, rarely will you have a tube that has average characteristics. For that reason, do not be surprised if some of the currents do not turn out to be exactly as specified. In other words, if you apply a driving voltage of 330 volts, and you measure the d-c grid current and find it is as rated, that is, minus 160 volts, then it is quite possible that the d-c grid current could be 35 or 45 instead of the 40 mls specified.

The Typical Operating Conditions are intended as a guide to the tube user. They are not intended to be hard and fast figures. Use them merely as a guide, but observe carefully the Maximum Ratings, because they are intended to keep the tube safe from harm, for your protection.—Lighthouse Larry.

ANTENNA ELEMENT STRENGTHENER

H. Lewis, VE3BYL

St. Catharines, Ontario

Thinwall conduit or aluminum tubing is used for the elements in most rotary beams. Fastening the insulators to these elements had always been a problem for me, until I thought of the following idea. (See Fig. 1.)

Simply cut up a broom handle into the required number of short pieces and drop them down the tubing until the wood is aligned in the proper posi-

tion. It is best to drill a hole in the tubing before inserting the wood. One piece of wood is used for each insulator.

Use of the internal wood structure actually strengthens the beam element, and a neat job is obtained because there are no protruding machine screws and bolts. The element just seems to be resting on top of the standoff insulator.

The length of the wood insert is not too important, although the longer it is, the more support it will give.

Make sure that the wood fits the inside of the tubing as tightly as possible—VE3BYL

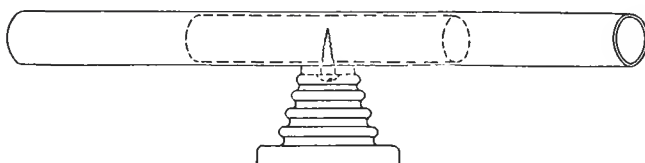


Fig. 1. Detail of strengthening piece used inside beam element

REPAIRING LOOSE ANODE CAPS

L. R. Nadeau, VE2GF

Quebec City, Quebec

Question: Is there any way of replacing either a top grid cap or a plate cap that has come off?

Answer: It is not too difficult to replace a grid or plate cap if you are willing to take a little trouble and do a good job. First heat the cap with a soldering iron until you remove all the solder on the top of the cap. When the solder is gone you will notice that there is a depression in the top of the cap. Clean this out carefully and make certain that the hole through the cap is large enough to pass the grid or plate lead on the tube.

Next remove all the old cement that was used to hold the cap on originally. This cement will probably be inside the cap as well as on the top of the tube. It can be scraped off with a knife.

Straighten the lead coming out the top of the tube and make sure that it is tinned. If it is necessary to tin it, hold the soldering iron to it for just the briefest moment.

Procure some sort of cement. There are a large

number of suitable cements on the market. If possible get a cement that is recommended for use with dissimilar articles. Fill the cap with cement, then place it on the top of the tube so that the lead comes up through the center hole. In most cases this lead will not extend above the top of the cap, but it will extend up into the depression in the cap.

At this point you can either let the cement dry, and solder later, or you can solder immediately. Either method will give good results unless the heat softens the cement after it has set. To solder, again be careful not to overheat the tube. Try to form a molten pool of solder in the depression in the tube cap.

When these repairs have been completed, the quality of the job will depend on the quality of the cement used. When you use the tube, be careful not to put excessive pressure on the cap, and if possible use a connector which can be opened, slipped over the cap, and tightened as you release it.—Lighthouse Larry.

ECONOMICAL QSL CARD

H. W. Hayes, VE3BEB

Ottawa, Ontario

Effective QSL cards may be made quite inexpensively in the following way. Procure a good quality Multilith stencil (paper plate) and a special pencil (Multigraph). On the stencil draw the QSL card, using the special pencil. The stencil is usually large enough so that two different designs may be drawn, if desired.

Take the stencil to a printing concern equipped with a Multigraph machine and have the required number of copies made. The printer can furnish the card stock. Printing can usually be done in a variety of colors. Further, a two-tone effect may be achieved by using a card of one color and printing with a second color. The cost is very small, the card is what you make it.—VE3BEB

(VE3BEB's QSL card is reproduced in Fig. 2. American amateurs who wish to try this idea can obtain the Multilith paper plate directly from the printer. Cost on this stencil should not exceed twenty-five cents. When making your QSL design, avoid large areas of solid color, as this reproducing process is unable to do a perfect job on filled-in areas. Your printer will be able to give you many valuable suggestions. For example, it is possible to get a two-color printing job at about the same price as a one-

color job, if you prepare your stencil so that one portion is for one color, and the other portion is for the second color. This, of course, may be printed on a card of a third color. The entire job should cost under a cent a QSL, if obtained in quantities of 500 and over.—Eds. note)

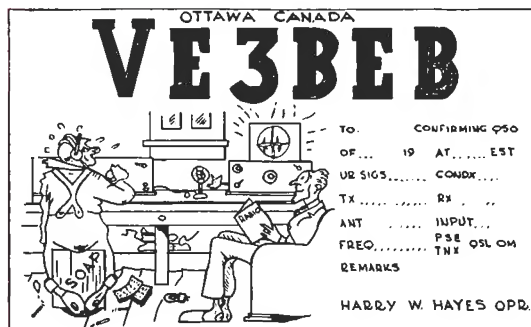


Fig. 2. Homemade QSL card of VE3BEB

AUTOMATIC LIGHTNING PROTECTION

R. Mercier, VE2ABT

Montreal, Quebec

Lightning protection for their antenna system is one thing that many amateurs desire and all amateurs should have. This protection need not be the sort of thing that will absorb a direct hit by lightning, but it should be the protection that is afforded by lightning arresters on buildings. The function of these is to slowly bleed the static electricity from the air and carry it to ground.

One method of lightning protection in common use is the spark gap arrangement, where an arc occurs when the static voltage builds up to a certain value. Homemade spark-gaps of this sort are not foolproof, however, and they may be hazardous.

The system about to be described provides a direct ground connection on the antenna at all times. The properties of the antenna are not altered in any way by this system. Further, the idea may be used on any one-band antenna.

A direct ground for the antenna system is made by connecting a shorted quarter-wave line across the transmission line, and connecting the shorted end of the quarter-wave stub to ground. (See Fig. 3.) It is a well-known fact that the impedance looking into a shorted quarter-wave stub approaches infinity. That is, the impedance is so very high that, for all practical purposes, the quarter-wave stub may be considered as not being there at all. However, insofar as a direct connection to ground is concerned, it is there.

For the ten-meter band a quarter-wave stub would be approximately eight feet long, and for higher-frequency bands the stubs get progressively shorter. For the lower-frequency bands quarter-wave stubs get rather lengthy and unwieldy, but for these low frequency bands another idea may be used. (See again Fig. 3.) In place of the quarter-wave stub, use a conventional tuned circuit with the center-tap of the coil grounded. As before, the tuned circuit presents a high impedance to the transmission line, and yet it provides a direct path to ground.

The voltage that will be present across the tuning condenser in the tuned circuit, for a perfectly flat line, is the square root of the product of transmitter output power and the line impedance. (For example, if the transmitter output were 600 watts, and the line had an impedance of 600 ohms, the rms voltage would be 600 times 600 or 360,000, the square root of which is 600 volts. The peak voltage would be 1.414 times this value, or 848.4 volts. With 100% amplitude modulation the voltage would again be doubled, for a total of 1,696.8 volts.)

However, most transmission lines are not flat, so that it is necessary to take the standing-wave ratio into account. In this case multiply the total voltage, computed as above, by the square root of the voltage standing-wave ratio. (For example, if the standing-wave ratio were two, the voltage present on the condenser if it were placed at the worst possible point would be the square root of two, which is 1.414 times the voltage. In the case cited above, the grand total of voltage would be 1.414 times 1,696.8 or approximately 2,375 volts.)—VE2ABT

(This idea is quite good, but it might be well to amplify several of the points made by VE2ABT.

All of the information given has assumed that the transmission line has no loss. Of course, with loss in the transmission line, the values of voltage found along it will be different. However, using the figures given you will arrive at a safe figure.

No information was given regarding the frequency sensitivity of the system. However, it is desirable to compute both the shorted quarter-wave stub and the tuned circuit for the mid-frequency of the band in question. Further, it is obvious that at any other frequency the quarter-wave stub will no longer be a quarter-wave long. At lower frequencies the stub will present an inductive reactance to the transmission line, and at higher frequencies the stub will present a capacitive reactance.

In other words, at frequencies other than the mid-band frequency the quarter-wave stub or the tuned circuit will affect the properties of the transmission line. In most cases this will not be serious, but, depending on the band in question and the transmission line used, it would be well to check the performance of the antenna system with the lightning protection scheme both connected and disconnected, and at frequencies near both edges of the band.

In the case of an antenna using tuned feeders, the voltage across certain portions of the transmission line are liable to be quite high. In this case it is advisable to connect the shorted quarter-wave stub or the tuned circuit to a point where the voltage is as low as possible. This stunt could also be used if the line were "flat," that is, connect to a point of minimum voltage.

If the tuned-circuit idea is used, design the circuit so that the L/C ratio is as high as practical, as this will make the tuned-circuit less frequency sensitive.—Eds. note.)

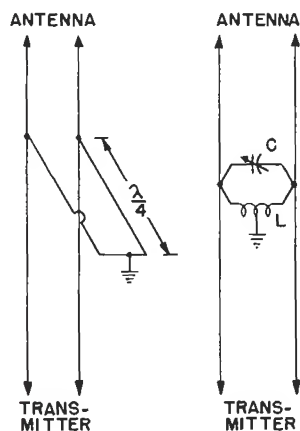


Fig. 3. Two lightning-protection schemes

FLUORESCENT LAMP INTERFERENCE

F. E. Shaw, VE1WM

St. John, New Brunswick

Question: What steps can the average ham take to keep QRN from nearby fluorescent lighting fixtures at a minimum? I would like to have an idea of how to approach this subject and I would also like to know what corrective measures should be taken. Is the majority of the interference radiated or carried along the power line? In the former case what aerial and/or lead-in arrangements are best? What should be done about the latter?—VE1WM

Answer: A complete answer to this question would be quite lengthy, but there are general rules which cover the subject of interference due to fluorescent lighting fixtures.

There are three causes of such interference. The first is direct radiation from the fluorescent lamp itself to the radio antenna or transmission line. The second is direct radiation from the a-c line, to which the fluorescent fixture is attached, to the radio antenna or transmission line. The third cause of interference is energy fed back through the a-c line and into the a-c line to which the receiver is connected.

In the cases of direct radiation, which constitute the first two interference causes mentioned above, the interference will be minimized in direct relation to the distance between the fluorescent lamp and the radio, antenna or transmission line.

If the radio is well shielded, and shielded transmission line is used, then the antenna itself must be located as far as possible from the fluorescent lamps, or the a-c line which feeds the fluorescent fixture. In

other words, use a well-shielded radio, use shielded transmission line, and locate the antenna at a distance from the a-c line and the lamp fixture. Obviously it is advisable to keep the transmission line, even though it is shielded, at as great a distance as possible from the a-c line.

The exact separation required to reduce the interference to the point where it cannot be heard will vary with the type of fluorescent fixture used and the size of fluorescent lamp used. For example, a forty-watt fluorescent lamp will give only minor interference on a sensitive receiver when it is located ten feet away from the antenna. A twenty-watt lamp can be as close as eight feet without causing noticeable interference.

Direct radiation interference can usually be cured by careful placement of the lamps if proper precautions are taken regarding shielding.

The third cause of interference, feedback through the a-c line itself, can usually be cured by any good a-c line filter. These need not be elaborate. One filter which has been used with moderate success consists of three 0.07 mf condensers. These are placed inside a shielded box, the case of which is grounded, and connected as follows. One condenser connects directly across the a-c line. The other two are put in series and then connected across the line. The mid-point of this pair is connected to ground. This filter should be put in the fluorescent fixture right at the point where the a-c line enters.—Lighthouse Larry.

EXTRA-RIGID COIL MOUNTING

A. E. Pugh, VE5AP

Baring, Saskatchewan

The excellent and popular Barker and Williamson Miniductor coils have just one small fault, and that is that they are difficult to mount securely. I have overcome this problem in the following manner. (Refer to the photograph, Fig. 4.) Procure a flat piece of polystyrene and cut it so that it is a little larger than the diameter of the coil.

Drill four holes in this piece of polystyrene spaced so that the plastic strips on the coil will fit snugly into them. It will be necessary to remove a few turns of

wire at each end of the coil in order to expose the plastic strips.

Arrange mounting holes in the polystyrene pieces, and tap where necessary. Then place the plastic strips in their respective holes, and cement the assembly together with polystyrene cement or ordinary household cement.

This method is very handy when Miniductors are used in VFO construction, where it is necessary to eliminate all vibration effects.—VE5AP

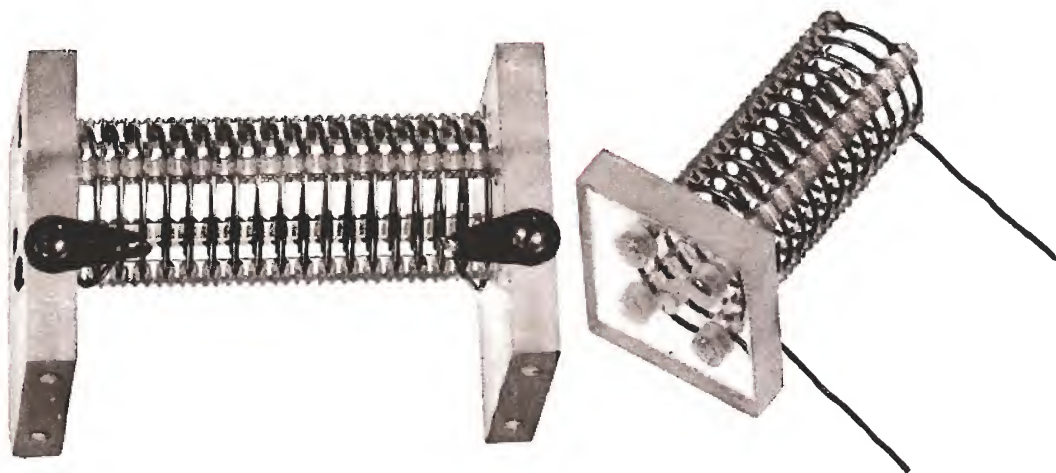


Fig. 4. Double-end and single-end mounting of B & W Miniductors

(This idea has been tried out in the *Ham News'* laboratory and is heartily recommended. The coil which uses two polystyrene ends was fastened to a chassis by means of machine screws and tested for rigidity. The assembly was sufficiently strong that the entire chassis could be picked up using the coil as a handle. The double-mounted coil is recommended where extreme rigidity is desired. Another advantage

is that lugs can be fastened to the polystyrene pieces, as shown in the photograph, to serve as terminal points for the coil connections.

A simpler version is also shown in Fig. 4. In this case only one end of the coil is mounted on a poly piece. This coil is not as rigid, but would serve where it did not control the frequency in a VFO.—Eds. note)

DYNAMIC SPEAKER FIELD POWER SUPPLY

N. Bacher, VE4NB

Brandon, Manitoba

For some reason or other, most amateurs seem to inherit a lot of speakers, but not permanent-magnet speakers. Ordinarily it is not easy to use a speaker with a field coil unless you build the speaker into a radio or a piece of test equipment which incorporates its own power supply. However it is quite simple to fix up a source of voltage for the field.

All that is required (see Fig. 5) is a selenium rectifier and an electrolytic condenser. Connect the rectifier and condenser as shown in the sketch, plug in to an a-c line, and you have a source of field current for the speaker.

I find it quite convenient to install the power supply right on the speaker, so that it is readily available to be hooked up to any piece of equipment.—VE4NB

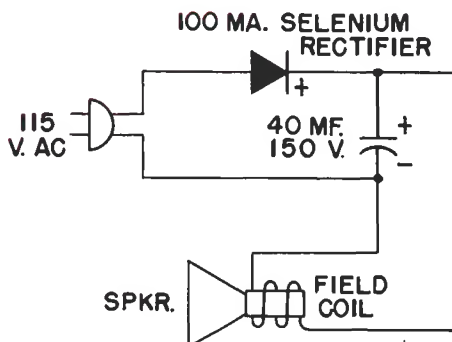


Fig. 5. Circuit diagram of power supply

COAXIAL ANTENNA CONNECTOR

W. R. Savage, VE6EO

Lethbridge, Alberta

Many a ham has wondered just how he would connect that nice new piece of coax to his doublet antenna without spending a lot of money on a fancy connector. This is how I solved the problem. You should be able to find all of the parts in your junk-box. (See Fig. 6.)

First procure a piece of insulating material, such as slate, mycalex, fiber, bakelite, etc. It should be approximately 5 inches long, $1\frac{1}{2}$ inches wide and one inch thick. A piece of slate cut from an old switchboard panel is what I used.

Other materials needed are a coaxial chassis connector, such as contained in a lot of the war surplus equipment, two flexible pigtails, and four 6-32 machine screws about $\frac{3}{8}$ inch long.

Drill the two end holes so that your antenna wire

will slip through easily. Drill a large hole so that the coaxial connector will fit into the insulating material. Then drill two holes at an angle to provide a path for the rear connection on the connector. Last, drill and tap the four holes for the mounting of the connector.

Solder one pigtail to the center terminal of the coaxial fitting and fish it through the hole drilled at an angle. Fill the large hole with cement before fastening the fittings, as this will seal the hole and keep moisture out. Put in three of the mounting screws and tighten them down. Under the fourth one put a solder lug. Now give the entire unit several coats of a good waterproof lacquer.

These units should last for years. I have one on each of my 80, 40 and 20 meter doublets.—VE6EO

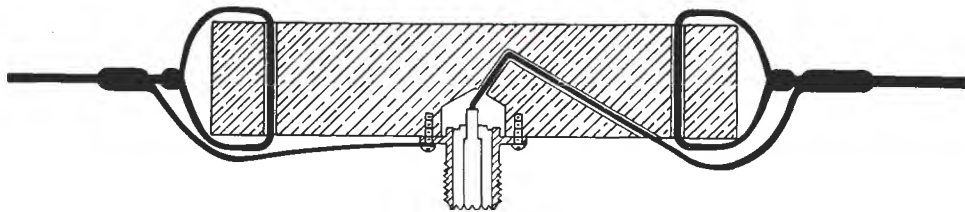


Fig. 6. Construction detail of coaxial antenna connector

Sweeping the Spectrum



My boss has a problem, and he seems quite happy to have come up with a question that I can't answer. I know he'll be much happier if he can get an answer, however, so I'm asking you, the readers of *Ham News*, to help me out, because only you can supply me with the information I need.

The question is, how would you like to have a complete set of the G-E *Ham News*, from Vol. 1 No. 1 through Vol. 4 No. 6, bound into an attractive book? I have tried to tell my boss that a great many amateurs would like a bound volume of the *Ham News*, but, being a boss, he insists on more details, such as how many hams is a great many!

"But," I said, "how else can hams get those out-of-date issues, like the one with the R-9'er description in, unless they get a bound volume?" I even went farther, and explained how a lot of hams would like to have the bound volume for its reference value, even though they had a complete, or almost complete set now. After all, a book lasts a lot longer than a lot of loose issues.

You may have noticed that the November-December, 1949 issue contained an index for all the previous issues. That would be the last issue bound, so that the book would have a convenient reference index on the last two pages.

Here's the way it works out. These issues of the *Ham News* would be bound in a cloth and board binding, just like a regular book, like your favorite detective novel or textbook, for example. This bound volume of the *Ham News* would cost \$2.00 or less, postpaid. Because we don't want to go ahead with this until we know if there are enough interested amateurs, I would like to hear from you.

If the idea sounds good to you and you would like to have one of these bound volumes of the G-E *Ham News*, just drop me a note on a penny postal card, saying, "Bound volume, YES," or, "Bound volume, NO." This postal card is not an order. It will merely be your vote. Please don't send any money, just your vote. If enough of you vote "YES," my boss will go right ahead and I'll let you know when the bound volumes are available. Send your vote to Lighthouse Larry, Bldg. 267, General Electric Co., Schenectady, N. Y.

Since the G-E *Ham News* has been available on a subscription basis I have received a great many letters from my readers telling me what a grand idea

it is. One amateur said that the only way he could get away from his QTH in the winter time was on snowshoes, so that he doubly appreciated being able to have the postman deliver his copy of the *Ham News* regularly. He didn't mention whether the postman had to use snowshoes to get to his place, so I suspect that he might have been kidding me just a bit, but at least he seemed to be happy about the whole situation and he backed this up with a buck for a subscription.

Don't get the idea that I'm trying to sell you a subscription to the *Ham News*. Actually all that interests me is keeping the *Ham News* good enough so that you will want to read it, because you know that you can get it free from any G-E tube distributor. Of course, our distributors are always happy to see you come in, even if it is only to pick up a copy of the *Ham News* or to ask for some advice on which is the best tube for your new rig.

My only thought in starting a subscription plan for this publication was to provide a mailing service for those of you who live in a remote area, and who might find it difficult to get *Ham News* for this or any other reason. I am happy that so many subscriptions have already come in, because this means I have that many more readers getting *Ham News* regularly.

Incidentally, by living in a remote area I didn't mean AC4 land, because this subscription plan is confined to the continental U.S., Alaska and Hawaii. Of course, if you can be reached by an APO or FPO address, then this is considered as continental U.S. because it's the address we are interested in.

In case you hadn't gotten the full details on the subscription plan, it is quite simple. The cost is \$1.00 per year and your G-E tube distributor or the General Electric Company gladly will supply you with a subscription card which you may fill out and return to me, enclosing the \$1.00 to cover handling and mailing charges for one year. Address here is *Ham News*, Tube Divisions, Electronics Dept., General Electric Company, Schenectady 5, N. Y.

This whole column so far has been about G.E. and the G-E *Ham News*, so let's end it by telling you, unless you've already seen it, that the new RCA *Ham Tips*, Spring 1950 issue, is a new size, a new layout, and more pages. In my opinion, a nice job.

—Lighthouse Larry

A NOTE ON EQUIPMENT DESIGN

Some amateurs have written me asking why I have not used any of the popular war-surplus items in the design of *Ham News* equipment. Perhaps this appears as a gross oversight, since many of these units contain components of excellent quality at extremely reasonable cost. However, there are a number of considerations which I feel make it undesirable for me to become involved in design around war-surplus components. These considerations become apparent if we consider the steps in the design of a new unit for publication in *Ham News*.

First of all, before he does any work, the designer has in mind a unit that is needed to perform a given job or a new and desirable way of performing a well-known job. He then has to consider the matters of power, simplicity, probable cost, etc. The tubes required are then chosen after considering their cost, performance in circuits of the type planned, and special features such as interelectrode capacities which may seriously affect the degree of shielding required.

Only at this stage of design is it practical to put numbers on the values of resistors, inductors, capacitors and voltages. Good engineering practice demands that L/C ratios and component values be carefully co-ordinated with the characteristics of the specific tubes chosen if the designer is to expect reasonable efficiency and freedom from the common "bugs" such as parasitics and/or excessive harmonics.

At this stage of design it is finally practical to choose specific component parts which will permit a neat, readily built, and attractive piece of equipment to be made. A complete working equipment is now constructed and its performance is checked in the laboratory against the designer's predicted figures. Minor changes may be made at this point of progress to obtain peak performance or to permit a more desirable mechanical arrangement. Then, if "on-the-air" checks verify all expectations the descriptive article is written to be published in *Ham News* in due time.

At the stage of design where specific component parts are chosen three prime qualifications are always held foremost:

1. Do the parts meet *all* of the designer's electrical requirements?
2. Do the parts lend themselves to a co-ordinated mechanical design and arrangement?
3. Are the parts currently manufactured and available from distributor's stocks? If not, are they readily built? (Especially in case of coils.)

I feel all three of these qualifications are desirable. Certainly the first qualification is a necessity from the point of view of the quality of the equipment described. The equipment simply won't meet the original performance requirements unless all parts meet all of the designer's requirements. The second qualification insures a minimum of "out board" shields and makeshift mechanical arrangements as well as insuring a design which will be a pleasing addition or modification for an existing amateur station. The third qualification *guarantees* that you can readily duplicate the results obtained during our tests, limited only by the care you take in adjusting and operating the equipment.—Lighthouse Larry.



Electronic
TUBE

HAM NEWS

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GEO. H. FLOYD, WAREY—EDITOR

FROM: